and achieved fame. It was accuracy and honesty of thought which carried him through.

Prof. Becquerel gives us a text-book of the whole matter for those who are prepared to go into the complete mathematical presentation. There is nothing original; it is a plain and unvarnished account of the theory as it stands, including the generalisations of Eddington and Weyl. We may note that the author adopts the general conclusion that the gravitational field is the manifestation of the non-Euclidean character of the structure of the Universe, and that mechanics and physics are reduced to geometry. Is it not time that this statement should be examined more carefully? It suggests that the cart is pulling the horse and that the concrete arises out of the abstract, the known out of the unknown. When the physicist lapses into metaphysics he is apt to leave his terms undefined.

Of the remaining books before us we may briefly say that Prof. Mie's is a French translation of a German pamphlet recently noticed in these columns, that M. Lémeray traces the history of the rise and fall and ultimate extinction (as he seems to consider it) of the idea of the "ether," and that Dr. von Horvath has thought it well to try to give a new presentation of the restricted principle of relativity.

E. CUNNINGHAM.

Principles of Spectacle Design.

Handbuch der gesamten Augenheilkunde. Begründet von A. Graefe und Th. Saemisch, fortgeführt von C. Hess. Herausgegeben von Th. Axenfeld und A. Elschnig. Dritte, neubearbeitete Auflage. *Die Brille als optisches Instrument.* Von Prof. Dr. M. von Rohr. Dritte Auflage. Pp. xiv+254. (Berlin: J. Springer, 1921.) In Germany, 66 marks; in England, 132 marks.

SINCE the first edition of this work appeared ten years ago, the design of spectacles has undergone important developments which are attributed by the author to the increased competition of large specialist manufacturers, to the interest of ophthalmologists and technical scientific workers, and to recent war experience.

The work is worthily dedicated to Allvar Gullstrand, upon whose optical treatment of the subject the theoretical portions are based, and more particularly those sections concerned with the eye in motion. It deals in a thorough and comprehensive manner with the comparatively simple geometrical principles involved in the design of spectacles for the correction of abnormal vision, but, as is clearly stated in the preface, it does not enter the sphere of the optical computer to whom the practical design is entrusted.

Those who are interested in the theoretical problems of spectacle design will find in this work a clear exposition of most aspects of the subject. The formulæ as well as the diagrams can be relied upon, as they are particularly free from errors. An introductory section deals with spectacles of various materials for special purposes. Section I. is devoted to anastigmatic lenses for both fixed and moving eyes. Section II. deals with astigmatic lenses, under which are included the various toric forms and combinations. In Section III. chromatic aberrations are considered, and apparent aberrations in the image space resulting from vision through spectacles are discussed in the concluding section. Although excellent source, name, and subject indexes are provided, there is unfortunately no index of the symbols employed. The systematic historical index of the first edition has been dispensed with, as the information is included under the various subject headings.

Nearly one-half of the text is devoted to historical references which increase the general interest of the work. As the author states in his preface, the desire to recognise the true inventor lies close to his heart. The task is a difficult one, and, if the author has failed in some respects, it may be attributed to a too ready use of German sources of information. The historical notes do not extend much beyond 1917, although, according to the title-page, the edition dated 1921 is stated to have been newly revised. Indeed, there is only one reference as recent as 1920. An English author is pilloried (p. 114) for the absurd accuracy of certain numerical data, but the author himself, in many instances records to within 1/1000 mm. ocular dimensions that are comparatively indefinite.

There is a tendency throughout the work to sacrifice clearness to generality. Spectacles, for example, are inadequately defined as "optical instruments that can be carried continuously before the eyes," the object being not to exclude extreme cases such as protective glasses for stone-hewers, spectacles for drivers, and those in which use is made of mica, horn, and other substances. But the reader will find more in this book by Dr. M. von Rohr for warm approval rather than for criticism. JAMES WEIR FRENCH.

Our Bookshelf.

A Manual of Determinative Mineralogy. By Prof. J. Volney Lewis. Third, revised and enlarged edition. Pp. v+298. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1921.) 16*s.* 6*d.* net.

WE have here an excellent guide to the recognition of mineral species. It is not intended to supersede the use of a standard work on mineralogy, but to train

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a student to acquire a first-hand knowledge of minerals and their distinguishing characters and ultimately a facility in identifying the commoner species at sight. There is a general classification occupying more than 130 octavo pages based on physical characters, especially streak, colour, and hardness, in the order named. After a rather full account of blow-pipe and other convenient chemical tests, including some which are not commonly employed in this country, there is another classificatory table of 70 pages constructed to assist in the identification of minerals by this means. This is followed by a third table based on the crystalline system and hardness. Perhaps greater stress might have been laid on specific gravity, the determination of which is frequently one of the most rapid means of "running down" a doubtful mineral. Also no mention is made of the use of a permanent horseshoe magnet with special adjustable poles by the help of which the comparatively weak magnetic character of minerals like monazite can be easily recognised even in the field. J. W. E.

(1) *Botany for Students of Medicine and Pharmacy.* By Prof. F. E. Fritch and Dr. E. J. Salisbury. Pp. xiv + 357. (London: G. Bell and Sons, Ltd., 1921.) 10*s.* 6*d.* net.

(2) *Junior Botany.* By T. W. Woodhead. Pp. 210. (Oxford: Clarendon Press, 1922.) 3*s.* 6*d.* net.

(3) *The Elements of Vegetable Histology.* By Prof. C. W. Ballard. Pp. xiv + 246. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1921.) 18*s.* net.

(1) Prof. Fritch and Dr. Salisbury have prepared an elementary text-book, which is stated in the preface to be for the use of students of medicine and pharmacy. A large number of new figures of plant structures are produced, and many of them will form a useful addition to botanical illustration. A few, however, such as Figs. 69 and 71, are too diagrammatic, sketchy, or ragged to be desirable for elementary students, and of course they are of no use for any other purpose. The book begins with the plant as a whole, using the Shepherd's-purse as type. It goes on with several chapters on the various plant organs and their functions. The chapter on plant cells concludes with an account of protoplasm in colloidal terms. Growing points, tissues, cell contents, and the structure of roots, stems, and leaves are then carefully treated, followed by physiology and the study of types. The book ends with a chapter on heredity and evolution, and an appendix dealing with reagents and methods. It covers adequately the syllabus for medical students and is one of the best we have seen for this purpose, but it is questionable if a somewhat more biological and scientifically imaginative treatment of the subject would not be to the advantage of elementary botanical teaching.

(2) The second volume under notice is a neatly produced little book of more elementary character, and well illustrated, the 140 figures being new with one exception. It begins with a chapter on the garden stock, followed by condensed treatment of seeds and germination, roots and their function, the shoot and its physiology, hibernation and movement in plants. The second part deals with the structure and biology of the flower, including pollination, fruits, dispersal, etc. Every beginning student would find it useful, particularly for its studies of flowers and fruits, and the price is very moderate.

(3) The only features we can recommend in Prof. Ballard's book are the paper and binding, and the first and the last chapters, dealing with the structure and use of the microscope and its accessories. The body of the work is too crude, even for the pharmacy students for which it is intended, to deserve the name of botany. A single quotation from p. 122 will be sufficient to indicate how many errors can be packed into one sentence. "Communication between the various cells forming a tracheid is effected by means of pores in the vessel walls." The illustrations can only be characterised as for the most part very poor. Fig. 29 is intended to illustrate mitosis, and is stated to be "modified" from Strasburger's text-book. The drawings are almost caricatures. They show centrosomes where none exist, and the name "polar bodies" is given to them! It is a disservice to botanical science to publish a book of this character. R. R. G.

The Autonomic Nervous System. By Prof. J. N. Langley. Part I. Pp. viii + 80. (Cambridge: W. Heffer and Sons, Ltd., 1921.) 5*s.* net.

THE present small volume gives a very useful summary, clearly and concisely written, of the present position of our knowledge of the subject of which it treats. The author divides the peripheral nerves into somatic and autonomic, and the latter into sympathetic (thoracico-lumbar, to all regions of the body), enteric (plexuses of Auerbach and Meissner), and parasympathetic, which is again divided into tectal (or ocular, supplying the sphincter of the iris and the ciliary muscle), bulbar (alimentary canal from nose and mouth to large intestine, with appendages, including the lungs), and sacral (lower part of large intestine, bladder, and external genitals). The several chapters deal with the divisions of the autonomic system and nomenclature; the general plan of origin and of peripheral distribution; the nerve fibres of the autonomic system; the specific action of drugs on the sympathetic and parasympathetic systems; and the tissues innervated. Each chapter is followed by a bibliography of important papers and by a series of notes.

First Course in the Theory of Equations. By Prof. L. E. Dickson. Pp. vi + 168. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1922.) 8*s.* 6*d.* net.

THE introduction to the Theory of Equations contained in this volume is wide enough to cover the needs of all except those who aspire to become mathematical specialists. The methods throughout are strictly elementary, the treatment reaching the algebraic solution of cubic and biquadratic equations without any reference to substitutions or group-theory. Useful chapters on determinants and elimination are included, while another one deals with elementary properties of symmetric functions. The book contains a severe course of computation within the scope of its subject-matter, and a considerable proportion of the abundant examples are numerical in character. Two subjects avoided by most writers of elementary

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